Climate-Smart Agriculture and Mechanization in Nepal

Presentation by

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Ministry of Agricultural Development

The 4th Regional Forum on Sustainable Agricultural Mechanization in Asia and the Pacific
Federal Democratic Republic of Nepal

7 provinces
3 ecological region
Mountain, Hill, Terai

The 4th Regional Forum on Sustainable Agricultural Mechanization in Asia and the Pacific
Nepal at a glance

- 75 districts, 217 Municipalities, 3200 VDCs
- Population 28 millions, 10 religions
- 125 caste/ethnic groups, 123 languages spoken as mother tongue
- Predominantly an agrarian country
- About 22% people still below poverty line
- Agriculture contributes one-third to GDP
- 21% of the land is cultivable (57% rain-fed)
- Average land holding – 0.68 ha
- Major crops Paddy, Maize, Wheat and Horticulture
- Livestock: Cattles, Buffaloes, Sheep/Goat, Pigs and Poultry
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Climatic condition is strongly influenced by the monsoon circulation. On the basis of monsoon phenomena, there are four seasons in Nepal:

- Winter (Dec-Feb)
- Pre-monsoon (Mar-May)
- Monsoon (Jun-Sep)
- Post Monsoon (Oct-Nov)

- Country receives more than 80% of annual rainfall during summer monsoon
- Avg. Monsoonal day -102 day
- Mean Annual rainfall- 1530 mm
- July is the wettest month (~26%)
- Nov. is the driest month (~0.6%)

Source: DoMH
Irrigation Status-2012/13 (Area in ha)

Irrigation Status of Nepal

<table>
<thead>
<tr>
<th>Cultivable Area</th>
<th>Irrigable Area</th>
<th>Total Irrigated Area</th>
<th>Surface Irrigation</th>
<th>Underground Irrigation</th>
<th>Farmer Managed Irrigation</th>
</tr>
</thead>
<tbody>
<tr>
<td>2641000</td>
<td>1766000</td>
<td>1331521</td>
<td>734440</td>
<td>359556</td>
<td>237525</td>
</tr>
</tbody>
</table>

Share of Irrigation Types in total Irrigated area

- Surface Irrigation: 55%
- Underground Irrigation: 27%
- Farmer Managed Irrigation: 18%

Source: DoI
Risks affecting Agri Production-A Major Challenge

- Vagaries of weather
  - rainfall
  - temperature
  - humidity
  - wind
  - hailstorm

- Pest & diseases
- Fire
- Flood
- Quality of inputs
- Market prices
The climate induced natural disaster causes **Loss of agricultural land & crop by climate related extreme events** *(1971-2007)*

<table>
<thead>
<tr>
<th>Events</th>
<th>Loss of agricultural land &amp; crop (ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drought</td>
<td>329332</td>
</tr>
<tr>
<td>Flood</td>
<td>196977</td>
</tr>
<tr>
<td>Hail storm</td>
<td>117518</td>
</tr>
<tr>
<td>Rains</td>
<td>54895</td>
</tr>
<tr>
<td>Strong wind</td>
<td>23239</td>
</tr>
<tr>
<td>Cold waves</td>
<td>21974</td>
</tr>
<tr>
<td>Others (forest epidemic, snow storm, firestorm, thunderstorm, avalanche, plague etc)</td>
<td>83336</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>847,648</strong></td>
</tr>
</tbody>
</table>


**12th in the world climate vulnerable country**
## Status of Agricultural Mechanization

### Households Using Various Machinery/Equipment for Agricultural Operations

<table>
<thead>
<tr>
<th>Machinery/Equipments used</th>
<th>No of Households</th>
<th>% Households</th>
</tr>
</thead>
<tbody>
<tr>
<td>Iron ploughs</td>
<td>1,073,441</td>
<td>28.02</td>
</tr>
<tr>
<td>Tractor &amp; Power tillers</td>
<td>920,371</td>
<td>24.03</td>
</tr>
<tr>
<td>Thresher</td>
<td>803,154</td>
<td>20.96</td>
</tr>
<tr>
<td>Pumping sets</td>
<td>548,203</td>
<td>14.31</td>
</tr>
<tr>
<td>Sprayers</td>
<td>574,014</td>
<td>14.98</td>
</tr>
<tr>
<td>Shallow tubewells</td>
<td>367,744</td>
<td>9.56</td>
</tr>
<tr>
<td>Deep tubewells</td>
<td>159,725</td>
<td>4.17</td>
</tr>
<tr>
<td>Treadle pump (Dhiki)</td>
<td>79,145</td>
<td>2.06</td>
</tr>
<tr>
<td>Animal drawn cart</td>
<td>334,978</td>
<td>8.74</td>
</tr>
<tr>
<td>Other Equipments</td>
<td>290,084</td>
<td>7.57</td>
</tr>
</tbody>
</table>

Source: National Sample Census of Agriculture, CBS, 2012
<table>
<thead>
<tr>
<th>Item</th>
<th>Unit</th>
<th>Quantity</th>
<th>Values (NRs 000)</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ploughs</td>
<td>Pcs.</td>
<td>41,610</td>
<td>8,884</td>
<td>China, India</td>
</tr>
<tr>
<td>Disc harrows</td>
<td></td>
<td>3,952</td>
<td>36,773</td>
<td>India</td>
</tr>
<tr>
<td>Cultivators/harrows</td>
<td></td>
<td>1,89,974</td>
<td>6,90,670</td>
<td>,,</td>
</tr>
<tr>
<td>Seeder/planter/transplanter</td>
<td></td>
<td>6,408</td>
<td>14,872</td>
<td>India, China</td>
</tr>
<tr>
<td>Threshers</td>
<td></td>
<td>21,358</td>
<td>4,80,053</td>
<td>India, China, USA, Japan</td>
</tr>
<tr>
<td>Tractors</td>
<td></td>
<td>16,693</td>
<td>58,38,984</td>
<td>China, India</td>
</tr>
<tr>
<td>Reaper/harvesters</td>
<td></td>
<td>3,557</td>
<td>44,327</td>
<td>,,</td>
</tr>
<tr>
<td>Fertilizer distributers</td>
<td></td>
<td>25,827</td>
<td>2,281</td>
<td>,,</td>
</tr>
<tr>
<td>Combine harvesters</td>
<td></td>
<td>78</td>
<td>66,521</td>
<td>,,</td>
</tr>
<tr>
<td>Cultivation machineries</td>
<td></td>
<td>8,063</td>
<td>2,212</td>
<td>,,</td>
</tr>
<tr>
<td>Mowers</td>
<td></td>
<td>51</td>
<td>609</td>
<td>China, India, Taiwan</td>
</tr>
<tr>
<td>Hay making machines</td>
<td></td>
<td>57</td>
<td>750</td>
<td>India</td>
</tr>
<tr>
<td>Fodder balers</td>
<td></td>
<td>27</td>
<td>1,415</td>
<td>India, China, Japan, Korea</td>
</tr>
<tr>
<td>Cleaning, sorting and grading</td>
<td></td>
<td>511</td>
<td>4,520</td>
<td>China, India</td>
</tr>
<tr>
<td>Animal feed making</td>
<td></td>
<td>1,76,232</td>
<td>3,23,756</td>
<td>Germany, Netherlands</td>
</tr>
<tr>
<td>Grain cleaner/grader</td>
<td></td>
<td>24,903</td>
<td>3,78,556</td>
<td>--</td>
</tr>
<tr>
<td>Milking machines</td>
<td></td>
<td>207</td>
<td>6,629</td>
<td>China, India</td>
</tr>
<tr>
<td>Milling machineries</td>
<td></td>
<td>4,541</td>
<td>5,29,125</td>
<td>Germ, Indonesia, Turkey</td>
</tr>
</tbody>
</table>

Source: DoC
Trend of Tractor Registered

2014/15: 16,693 Nos.

Source: Dept of Transport

- **Sept 20, 2015** by the house representatives of the people
- Its fundamental law of Federal Democratic Republic of Nepal
- 37 divisions, 304 articles and 7 annexes
- 7 **federal provinces**, Kathmandu as capital
Constitution of Nepal 2072:
Article 51. **State policies**: The State shall pursue the following policies: section (h) Policies regarding the basic needs of citizens:
Point (12) Increasing investment in the agricultural sector by making necessary provisions for sustainable productivity, supply, storage and security, while making it easily available with effective distribution of food grains by *encouraging food productivity that suits the soil and climate conditions of the country in accordance with the norms of food sovereignty.*
Agricultural Development Strategy (ADS)
20 years strategic planning 2015-2035

4 STRATEGIC FRAMEWORK

4.4.1 Food and Nutrition Security

184. Component 2 of the ADS on Productivity has an impact of food and nutrition security by (i) increasing the volume of food production in Nepal in a sustainable way through higher productivity and sustainable use of natural resources; and (ii) reducing vulnerability of farmers through improved food/feed/seed reserves, improved preparedness and response to emergencies, and climate smart agricultural practices.
Agricultural Mechanization Promotion Policy, 2014
Approved by the GoN on 29th. August 2014
Vision
"To contribute national development through agriculture mechanization in present agriculture system to transform to modernization and commercialization."
Clause 9. **Objective**: 4 main point to achieving AgrilMech

➢ **Identification and promotion of women and environment friendly agriculture machineries**
Agricultural Mechanization Promotion Policy, 2014

- Promotion of fuel efficient and environment friendly machines will be encouraged.
- Promotion of technology and machines appropriate for sustainable agriculture and resource conservation will be encouraged.
- Use and promotion of the machines reducing the tedious and hard work load of women will be focused.
- Agricultural machines and equipments utilized for production of organic fertilizer, organic and bio-pesticides and Integrated Pest Management (IPM), Integrated Nutrition Management (INM), Good Veterinary Practices (GVP), Good Livestock Practices (GLP), Good Agricultural Practices (GAP) and Good Fishery Practices will be promoted and extended.
- Use of renowned materials and communications technology for the promotion of appropriate agricultural machines and equipments will be focused.
Government of Nepal approved the law

Combine Harvester along with baler or Straw Chopper has to be imported for straw mgmt

Paris Agreement- United Nations Framework Convention on Climate Change (UNFCCC)

• “individual nationally determined contributions” (INDCs) has already been submitted,
Government Organization working for CSA and Mechanization

Government of Nepal

- Ministry of Population and Environment (Focal Point)
  - Alternative Energy Promotion Centre (AEPC)
- Ministry of Science and Technology
  - National Information Technology Center (NITC)
  - Nepal Academy of Science and Technology
  - Pilot Program for Climate Resilience (PPCR)
- Ministry of Agricultural Development
  - PPCR: Building Resilience to Climate Related Hazards Project - Agriculture Management Information System (AMIS)
  - Directorate of Agricultural Engineering, Department of Agriculture
  - Agricultural Engineering Division, Nepal Agricultural Research Council
- Ministry of Irrigation
  - Non Conventional Irrigation Technology Project (NITP), Department of Irrigation
### Donors Agency

<table>
<thead>
<tr>
<th>World Bank</th>
<th>ADB</th>
</tr>
</thead>
<tbody>
<tr>
<td>FAO</td>
<td>USAID</td>
</tr>
<tr>
<td>UKAID</td>
<td>European Union</td>
</tr>
</tbody>
</table>

### NGO/INGO/Development organization

- International Center for Integrated Mountain Development (ICIMOD)
- CIMMYT Cereal System Initiative for South Asia in Nepal (CSISA-NP)
- iDE-Nepal
- Renewable World
- SAMARTH
- IRRI
- Winrock
- Practical Action
- SNV Nepal
- CEAPRED
- LI-BIRD
- Private Sector
Water Smart:

- Drip & Sprinkler
- Rain water harvesting
- Low cost water storage (Thai jars, Soil-cement tanks)
- Solar lift irrigation
- Papa & Barsha pump lift
- Mulching

- Precision Land Levelling
- Raised bed
- Direct Seeding
- Alternate wetting and drying
- linking tap to irrigation /conservation ponds
- zero waste of water by behavior change,
Market Access and Water Technologies for Women Project (MAWTW, 2013-16) USAID supported iDE-Nepal

Small Scale Drip Irrigation

Solar Lift Irrigation (Renewable World)

Thai Jar for MUS
Papa Pump (Hydraulic Ram)

Imported and Installed by NAFSeeds

**Design for zero energy**
**Pumping up to 500 meters vertically.**

Example system layout:
Barsha Pump (Spiral)

Developed by aQysta and promoted and implemented by Practical Action and distributed by NAFSeeds
Weather Smart:

- Weather Forecast
- Insurance
- Weather index based insurance
- Weather based agro-advisory,
- Plastic Tunnel for hailstorms and rains
- Crop Diversification
- Agroforestry

Climate and weather information
Nutrient Smart:
- Green Manuring
- Legume Integration
- Bio-fertilizer
- Bio-pesticide
- Cattle-Shed mgmt

Carbon Smart:
- No-Tillage
- Minimum Tillage
- Residue Management
- Planting perennials,
- Agro-forestry
- Fruit orchard
Energy Smart:

- No-Tillage
- Minimum Tillage
- Residue Management
- Direct Seeded Rice
- Biogas (CDM), Bio briquet and renewable energy
- Solar Pumping
- Papa & Barsha Pump
Knowledge Smart:

- ICTs
- Mobile Apps & SMS
- Call Center
- Toll Free Number
- Gender Empowerment
- Capacity Development
- Behavior Change
- Exposure visit
Haulage Smart:

- Gravity Goods Rope Ways
- Cable Ways (Tow-in)
Climate-Smart Village (CSV)

- International Center for Integrated Mountain Development (ICIMOD) funded Center for Environmental and Agricultural Policy Research, Extension and Development (CEAPRED)
- 4 sites Mahadevsthan, Nayagaun and Patalekhet VDCs of Kavre district - key interventions

- **Water management:** mulching, linking tap to conservation/irrigation ponds, water retention techniques, sprinkler or drip, zero waste of water by behavior change, land leveling, raised beds

- **Crop and cropping patterns management:** right crop combination and/or cropping patterns, zero tillage, Inter cropping and multi-cropping

- **Use of crop residues:** harvest paddy and wheat 1 foot above ground

- **Energy smartness:** In combination of point 3 above
Example of CSA and Mechanization Technology

Climate-Smart Village (CSV)

• **Nutrient & Fertilizer management:** use of bio fertilizer, bio pesticides introduced IPM, Cowshed management
• **ICT services and linking farmers to experts:** farmers linked with a call centre provides them for weather and contact experts.
• **Gender friendly community institutions:** Group formation and capacity development, linking credit/cooperative small scale saving communities particularly for women and marginalized, in building their confidence, for gender and social inclusion, women friendly machine.
• **Linking for biogas promotion:** Farmers linked to APEC/Nepal Biogas Program for biogas plant installation under national biogas support and subsidy, small scale solar panel for electrification.
• **Crop and cattle insurance:** linked to the government's crop and livestock insurance subsidy program.
• **Exposure Visit:** to Samastipur and Vaishali districts of India Borlaug Institute of South Asia (BISA) farm and Climate Smart Villages (CSV)
Issues and Challenges

- Geographical setting
- Low investment from public and private sector for the mechanization
- Limited access to machineries, spare parts and after-sales services
- Weak organization setup in the government system
- Energy supply
- Youth migration to urban and aboard leaving old age and women.
- Credit facility and high interest rates from financial institutions
- Monsoon dependent agriculture
- Unavailability of weather forecast (Weekly, Monthly, Seasonal, Annual)
- Natural calamities; Floods, Land Slides, Cold & Hot Weather, Drought and Earthquakes.
- Recurrent climate related hazards
Conclusion

- Nepal is highly vulnerable from climate change point of view (ranked 12th most vulnerable country in the world).
- It has threatened food and nutrition security of millions of people, especially women and marginalized groups of people.
- Nepal has conducive policy environment to address these problems/issues and government has put thrust by taking several policy initiatives, including ADS.
Conclusion

- Adopt suitable technology from other countries and do adoptive research based in local conditions.

- There is a need for coordinated effort to build up synergy based on lesson learnt to combat the ill-effect of climate change through climate-friendly activities.

- MoAD is committed to work in collaboration with I/NGOs, private sector, and other development partners in the implementation of ADS for addressing the climatic variability's and climate change to achieve the ADS vision and national goal of food and nutrition security and improved livelihoods in Nepal.
Thank you

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